9th Class 2015		
Chemistry	Group-I	Paper-I
Time: 2.45 Hours	(Subjective Type)	Marks: 63

(Part-I)

Q.2. Write short answers to any Five (5) questions: 10

(i) Differentiate between Homo-atomic and Hetero-atomic molecules.

Ans A molecule containing same type of atoms is called homoatomic molecule. For example: hydrogen (H_2), ozone (O_3), sulphur (S_8) and phosphorus (P_4).

When a molecule consists of different kinds of atoms, it is called heteroatomic molecule. For example: CO_2, H_2O and NH_3.

(ii) Write the chemical formulae of Aluminium Sulphate and Calcium Phosphate.

Ans The chemical formulae of Aluminium Sulphate and Calcium Phosphate is given below:

Aluminium Sulphate = $Al_2(SO_4)_3$

Calcium Phosphate = $Ca_3(PO_4)_2$

(iii) Define Avogadro's Number.

Ans Avogadro's Number is a collection of 6.02×10^{23} particles. It is represented by symbol 'N_A'. Hence, the 6.02×10^{23} number of atoms, molecules or formula units are called Avogadro's number. It is equivalent to one 'mole' of respective substance. In simple words, 6.02×10^{23} particles are equal to one mole as twelve eggs are equal to one dozen.

(iv) Write down the Electronic Configuration of Chloride ion.

Ans Chlorine has 17 electrons and chloride ion (Cl^-) has 17 + 1 = 18 electrons. Its electronic configuration will be 2,

8, 8. The further distribution of electrons in subshells will be $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$.

(v) What is meant by carbon dating?

Ans An important method of age determination of old carbon containing objects (fossils) by measuring the radioactivity of C-14 in them is called radio-carbon dating or simply carbon dating.

(vi) Write any two properties of canal rays.

Ans Following are two properties of canal rays:

1. Their deflection in electric and magnetic field proved that they are positively charged.
2. The nature of canal rays depends upon the nature of gas, present in the discharge tube.

(vii) State Mendeleev's Periodic Law.

Ans Mendeleev's Periodic Law states that "Properties of the elements are periodic functions of their atomic masses."

(viii) Why the second ionization energy of an element is higher than first one?

Ans When there is more than one electron in the valence shell, they can be removed one by one by providing more and more energy. Such as group 2 and 3 elements have more than one electron in their shells. Therefore, they will have more than one ionization energy values.

Q.3. Write short answers to any Six (6) questions: 12

(i) Write down general electronic configuration of carbon family.

Ans The general electronic configuration of carbon family is given below:

Carbon family = $ns^2\ np^2$

(ii) What is meant by Lone Pair and Bond Pair of electron in molecule?

Ans The non-bonded electron pair available on an atom, like the one available on nitrogen in ammonia, ($\dot{N}H_3$) is

called a lone pair. The electrons that pair up to form a chemical bond are called 'bond pair' electrons.

(iii) Define the term boiling point.

Ans Boiling point is defined as the temperature at which the vapour pressure of a liquid becomes equal to the atmospheric pressure or any external pressure.

(iv) Evaporation causes cooling. Explain.

Ans Evaporation is a cooling process. When the high kinetic energy molecules vapourize, the temperature of remaining molecules falls down. To compensate this deficiency of energy, the molecules of liquid absorb energy from the surroundings. As a result, the temperature of surroundings decreases and we feel cooling. For example, when we put a drop of alcohol on palm, the alcohol evaporates and we feel cooling effect.

(v) Define the term vapour pressure.

Ans The pressure exerted by the vapours of a liquid at equilibrium with the liquid at a particular temperature is called vapour pressure of a liquid.

(vi) Define solute and solvent.

Ans **Solvent:**

The component of a solution which is present in larger quantity is called solvent. Solvent always dissolves solutes. For example, water is a solvent.

Solute:

The component of solution which is present in smaller quantity is called solute. For example, salt solution is made by dissolving salt in water. So in salt solution, salt is the solute and water is solvent.

(vii) How can we distinguish between solution and pure solvent?

Ans The simplest way to distinguish between a solution and a pure liquid is evaporation. The liquid which evaporates completely, leaving no residue, is a pure solvent, while a liquid which leaves behind a residue on evaporation is solution.

(viii) **Define the term Unsaturated solution.**

Ans A solution which contains lesser amount of solute than that required to saturate it at a given temperature, is called unsaturated solution.

Such solutions have the capacity to dissolve more solute to become a saturated solution.

(ix) **Give two examples of colloids.**

Ans These are solutions in which the solute particles are larger than those present in the true solution but not large enough to be seen by naked eye.

Examples are starch, albumin and soap solutions, blood, milk, ink, jelly, toothpaste, etc.

Q.4. Write short answers to any Five (5) questions: 10

(i) **Define Electroplating.**

Ans Electroplating is depositing of one metal over the other by means of electrolysis.

(ii) **What are non-electrolytes? Give example.**

Ans The substances, which do not ionize in solution and do not allow the current to pass through their solutions, are called non-electrolytes. For example, sugar solution and benzene are non-electrolytes.

(iii) **What are redox reactions?**

Ans Chemical reactions in which the oxidation state of one or more substances changes are called oxidation-reduction or redox reactions.

(iv) **Write the names of Electrochemical cells.**

Ans Electrochemical cells are of two types:

(1) Electrolytic cells (2) Galvanic cells

(v) **What is the difference between Anode and Cathode?**

Ans The electrode connected to positive terminal is called anode and electrode connected to the negative terminal is called cathode.

(vi) **Define metal. Give two examples.**

Ans Metals are the elements (except hydrogen) which are electropositive and form cations by losing electrons. Metals can be categorized:

(a) Very reactive: potassium, sodium, calcium, magnesium and aluminium.

(b) Moderately reactive: zinc, iron, tin and lead.

(c) Least reactive or noble: copper, mercury, silver and gold.

(vii) **Write any two uses of Silver.**

Ans Alloys of silver with copper are widely used in making coins, silver-ware and ornaments. Compounds of silver are widely used in photographic films and dental preparations. Silver also has important applications in mirror industry.

(viii) **Give chemical reaction between methane (CH_4) and chlorine (Cl_2) in the presence of diffused light.**

Ans In presence of diffused sunlight, the reaction of chlorine with methane is slow and gives series of compounds *i.e.*, CH_3Cl, CH_2Cl_2, $CHCl_3$ and CCl_4.

(Part-II)

NOTE: Attempt any Three (3) questions.

Q.5.(a) State any three differences between compound and mixture. **(3)**

Ans **Differences between compound and mixture:**

Compound	Mixture
i. It is formed by a chemical combination of atoms of elements.	Mixture is formed by the simple mixing up of the substances.
ii. The constituents lose their identity and form a new substance having entirely different properties from them.	Mixture shows the properties of the constituents.
iii. Compounds always have fixed composition by mass.	The minimum number and ratio of the components may not be fixed.

(b) State any four properties of Cathode rays. **(4)**

Ans Following are the four properties of Cathode rays:

(i) These rays travel in a straight line perpendicular to the cathode surface.

(ii) They can cast a sharp shadow of an opaque object if placed in their path.

(iii) They are deflected towards positive plate in an electric field showing that they are negatively charged.

(iv) They raise temperature of the body on which they fall.

Q.6.(a) Discuss any three important features of modern periodic table. (3)

Ans Following are three important features of modern periodic table:

i. This table consists of seven horizontal rows called periods.

ii. First period consists of only two elements. Second and third period consist of 8 elements each. Fourth and fifth period consist of 18 elements each. Sixth period has 32 elements while seventh period has 23 elements and is incomplete.

iii. There are 18 vertical columns in the periodic table numbered 1 to 18 from left to right, which are called groups.

(b) Describe the properties of ionic compounds. (4)

Ans The ionic compounds have following properties:

i. Ionic compounds are mostly crystalline solids.

ii. Ionic compounds in solid state have negligible electrical conductance but they are good conductors in solution and in the molten form. It is due to presence of free ions in them.

iii. Ionic compounds have high melting and boiling points. For example, sodium chloride has melting point 800°C and a boiling point 1413°C. As ionic compounds are made up of positive and negative ions, there exist strong electrostatic forces of attraction between oppositely charged ions. So, a great amount of energy is required to break these forces.

iv. They dissolve easily in polar solvents like water. Water has high dielectric constant that weakens the attraction between ions.

Q.7.(a) A gas at pressure 912 mm of Hg has volume 450 cm^3. What will be its volume at 0.4 atm? (3)

Ans $V_1 = 450\ cm^3$

$P_2 = 0.4$ atm

$V_2 = ?$

1 atm = 760 mm of Hg

$0.4 \text{ atm} = 760 \times 0.4$

$\boxed{P_2 = 304 \text{ mm of Hg}}$

$P_1V_1 = P_2V_2$

$\frac{P_1V_1}{P_2} = V_2$

$\Rightarrow \quad V_2 = \frac{P_1V_1}{P_2}$

$V_2 = \frac{912 \times 450}{304}$

$\boxed{V_2 = 1350 \text{ cm}^3}$

(b) What are the effects of temperature on solubility? Explain. (4)

Ans Temperature has major effect on the solubility of most of the substances. Generally, it seems that solubility increases with the increase of temperature, but it is not always true. When a solution is formed by adding a salt in solvent, there are different possibilities with reference to effect of temperature on solubility. These possibilities are discussed here.

(i) Heat is absorbed:

When salts like KNO_3, $NaNO_3$ and KCl are added in water, the test tube becomes cold. It means during dissolution of these salts heat is absorbed. Such dissolving process is called 'endothermic'.

$$\text{solvent} + \text{solute} + \text{heat} \longrightarrow \text{solution}$$

Solubility usually increases with the increase in temperature for such solutes. It means that heat is

required to break the attractive forces between the ions of solute. This requirement is fulfilled by the surrounding molecules. As a result, their temperature falls down and test tube becomes cold.

(ii) Heat is given out:

On the other hand, when salts like Li_2SO_4 and $Ce_2(SO_4)_3$ are dissolved in water, the test tube becomes warm. *i.e.*, heat is released during this dissolution.

solvent + solute ⟶ solution + heat

In such cases, the solubility of salt decreases with the increase of temperature. In such cases, attractive forces among the solute particles are weaker and solute-solvent interactions are stronger. As a result, there is release of energy.

(iii) No change in heat:

In some cases, during a dissolution process, neither the heat is absorbed nor released. When salt like NaCl is added in water, the solution temperature remains almost the same. In such case, temperature has a minimum effect on solubility.

Q.8.(a) How electroplating of chromium is carried out?

Ans **Electroplating of Chromium:**

The electroplating of chromium is carried out in the same way as that of silver. The object to be electroplated is dipped in aqueous solution of chromium sulphate containing a little sulphuric acid that acts as an electrolyte. The object to be electroplated acts as cathode while anode is made of antimonial-lead. The electrolyte ionizes and provides Cr^{3+} ions, which reduce and deposit at cathode.

Electrolyte produces the following ions:

$$Cr_2(SO_4)_{3(s)} \xrightarrow{water} 2Cr^{+3}_{(aq)} + 3SO_4^{-2}{}_{(aq)}$$

Reactions at the electrodes are as follows:

$$\text{At anode: } 4OH^-_{(aq)} \longrightarrow 2H_2O_{(l)} + O_{2(g)} + 4e^-$$

$$\text{At cathode: } Cr^{+3}_{(aq)} + 3e^- \longrightarrow Cr_{(s)}$$

For practical convenience, the steel is usually plated first with nickel or copper and then by chromium because it does not adhere well on the steel surface. Moreover, it allows moisture to pass through it and metal is stripped off. The nickel or copper provides adhesion and then chromium deposited over the adhesive layer of copper lasts longer. This type of electroplating resists corrosion and gives a bright silvery appearance to the object.

(b) Write down four uses of silver in daily life. (4)

Ans Silver is white lustrous metal. It is an excellent conductor of heat and electricity. It is also highly ductile and malleable metal. Its polished surfaces are good reflectors of light. Formation of thin layer of oxide or sulphide on its surface makes it relatively unreactive. Under normal conditions of atmosphere, air does not affect silver. It tarnishes in presence of sulphur containing compounds like H_2S.

Being very soft metal, it is rarely used as such. Alloys of silver with copper are widely used in making coins, silver-ware and ornaments. Compounds of silver are widely used in photographic films and dental preparations. Silver also has important applications in mirror industry.

Q.9.(a) Give comparison of Electrolytic and Galvanic Cell. (3)

Ans **Comparison of Electrolytic and Galvanic Cells**

Electrolytic Cell	Galvanic Cell
i. It consists of one complete cell, connected to a battery.	It consists of two half cells connected through a salt bridge.
ii. Anode has positive charge while cathode has negative charge.	Anode has negative charge while cathode has positive charge.
iii. Electrical energy is converted into chemical energy.	Chemical energy is converted into electrical energy.
iv. Current is used for a non-spontaneous chemical reaction to take place.	Redox reaction takes place spontaneously and produces electric current.

(b) Differentiate between electrolytes and non-electrolytes with examples. (4)

Ans The substances, which can conduct electricity in their solutions or molten states, are called electrolytes. For

example, solutions of salts, acids or bases are good electrolytes. The electricity cannot pass through solid NaCl but its aqueous solution or molten NaCl are good electrolytes. Electrolytes are classified into two groups depending upon their extent of ionization in solution.

Strong Electrolytes:

The electrolytes which ionize completely in solution and produce more ions, are called strong electrolytes. Example of strong electrolytes are aqueous solutions of NaCl, NaOH and H_2SO_4 etc.

$$NaOH_{(s)} \xrightarrow{H_2O} Na^+_{(aq)} + OH^-_{(aq)}$$

Weak Electrolytes:

The substances which ionize to a small extent when dissolved in water and could not produce more ions are called weak electrolytes. Acetic acid (CH_3COOH) and $Ca(OH)_2$ when dissolved in water, ionize to a small extent and are good examples of weak electrolytes. Weak electrolytes do not ionize completely. For example, ionization of acetic acid in water produces less ions:

$$CH_3COOH_{(l)} + H_2O_{(l)} \rightleftharpoons CH_3COO^-_{(aq)} + H_3O^+_{(aq)}$$

As a result, the weak electrolyte is a poor conductor of electricity.

Non-Electrolytes:

The substances, which do not ionize in solution and do not allow the current to pass through their solutions, are called non-electrolytes. For example, sugar solution and benzene are non-electrolytes.

(Part-III)

(Practical Part)

Note: Attempt any Two (2) questions.

A-(i) Write the materials required to determine the boiling point of Acetone. (2)

Ans 250 cm^3 beaker, thermometer, Bunsen burner, tripod stand, wire gauze, glass stirrer, fusion tube, capillary tube, iron stand with clamp, dropper, thread / rubber band, match box, water, given organic compound (acetone).

(ii) Write the procedure to determine the boiling point of Ethyl Alcohol. (3)

Ans Take some quantity of ethyl alcohol in a fusion tube. Take 250-cm^3 beaker and add about 100 cm^3 water into it. Place this beaker on the tripod stand. Dip the thermometer and the fusion tube into the beaker containing water and suspend it with an iron stand. Now heat the beaker gently with continuous stirring to keep the temperature of water uniform. Note down the temperature at which the continuous bubbles start coming out from the open end of the capillary tube. Repeat the experiment twice and take the mean value.

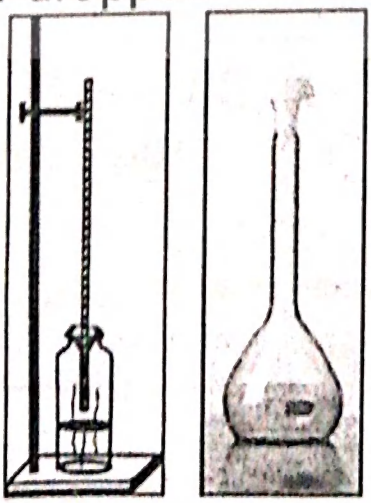
B-(i) Write the apparatus to make 100 cm^3 of 0.1 M Sodium hydroxide solution. (2)

Ans Top loading balance, solid NaOH, distilled water, watch glass, measuring flask (100 cm^3) with stopper, spatula, funnel, beaker (100 cm^3).

(ii) Write the procedure to prepare 250 cm^3 of 0.1M Hydrochloric Acid solution. (3)

Ans **Materials Required:**

Distilled water, 12.0 M HCl (stock solution), measuring flask (250 cm^3), beaker, glass rod, burette, funnel, wash bottle or dropper.



Procedure:

1. In order to calculate the volume of the concentrated HCl solution (stock solution) needed to prepare the required solution, let us apply the following molarity equation

12 M HCl solution (given)		0.1 M HCl solution (required)
M_1V_1	=	M_2V_2
$12 \times V_1$	=	0.1×250
V_1	=	$\frac{0.1 \times 250}{12}$
V_1	=	$2.00\ cm^3$

2. Fix the burette in the burette stand and fill it with the given concentrated HCl solution carefully using a funnel.
3. Take 100 cm^3 distilled water in the measuring flask (250 cm^3).
4. From the burette add 2.00 cm^3 of HCl solution into the measuring flask.
5. Further dilute this solution with distilled water and make up the volume up to the etched mark with the help of wash bottle or dropper containing distilled water and stopper it.
6. Turn the flask upside down to thoroughly mix the solution.

Result:

0.1 M of HCl solution of 250 cm^3 from 1 M HCl solution is prepared.

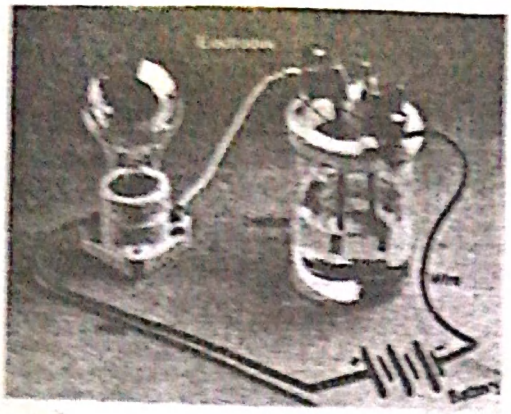
C-(i) Write down the material for the experiment that temperature affects the solubility of solids in water. **(2)**

Ans Beaker (250 cm^3), Bunsen burner, iron stand, tripod stand, wire gauze, glass rod, safety goggles, sucrose (sugar) and water.

(ii) Write the procedure to check the conductivity of different solutions. **(3)**

Ans **Material Required:**

Battery, electrodes, key, connecting wires, bulb, beakers (250 cm^3), distilled water, NaCl, HCl, NaOH, sugar and vinegar.



Procedure:

1. Take five beakers each containing 100 cm^3 distilled water.
2. Dissolve 2.5 g each of NaCl, NaOH and sugar in separate beakers and stir well to make homogeneous solutions.
3. Similarly, in the remaining beakers add in each 2.5 cm^3 HCl and 2.5 cm^3 vinegar solution. Stir the solutions well.
4. Connect the electrodes in the circuit as shown in the diagram.
5. Dip the electrodes one by one in each beaker and note whether the bulb glows or not.

Observations:

Observation No.	Name of the compound dissolved in water	Bulb glows/ bulb does not glow	Result
1.	Distilled water	does not glow	Non-electrolyte
2.	Table sugar	does not glow	Non-electrolyte
3.	NaCl	glow	electrolyte
4.	NaOH	glow	electrolyte
5.	HCl	glow	electrolyte
6.	Vinegar	glow weakly	Weak electrolyte

Result:

Solutions of NaCl, NaOH and HCl conduct electricity. Solutions of table sugar, vinegar and distilled water do not conduct electricity.